

IN THE CLAIMS:

The following is a complete listing of the claims, reflects all changes currently being made thereto, and replaces all earlier versions and listings:

1. (currently amended): An electron-emitting device comprising:
a cathode electrode;
a layer electrically connected to the cathode electrode; and
a plurality of particles, each comprising as a main component a material which has resistivity lower than resistivity of a material of the layer, wherein
the plurality of particles are arranged in the layer, and
a density of the particles in the layer is 1×10^{14} particles/cm³ or more and 5×10^{18} particles/cm³ or less.

2. (previously presented): An electron-emitting device comprising:
a cathode electrode;
a layer electrically connected to the cathode electrode; and
a plurality of particles, each comprising as a main component a material, which has resistivity lower than resistivity of a material of the layer, wherein
the plurality of particles are arranged in the layer, and
a concentration of a main element of the particles with respect to a main element of the layer is 0.001 atm% or more and 1.5 atm% or less.

3. (previously presented): An electron-emitting device comprising:
a cathode electrode;
a layer electrically connected to the cathode electrode; and

a plurality of particles, each comprising as a main component a material which has resistivity lower than resistivity of a material of the layer, wherein

the plurality of particles are arranged in the layer,

a density of the particles in the layer is $1 \times 10^{14}/\text{cm}^3$ or more and $5 \times 10^{18}/\text{cm}^3$ or less, and

a concentration of a main element of the particles with respect to a main element of the layer is 0.001 atm% or more and 1.5 atm% or less.

4. (currently amended): An electron-emitting device comprising:

a cathode electrode;

a layer which is arranged on the cathode layer and contains carbon as a main component; and

at least two particles which are arranged so as to be adjacent to each other in the layer and comprises metal as a main component, wherein

one of the adjacent two particles is arranged to be nearer to the cathode electrode than the other particle, and

the metal is selected from the group consisting of Co, Ni, and Fe, and wherein

the layer contains hydrogen of 0.1 atm% or more with respect to the carbon in the layer.

5. (previously presented): An electron-emitting device comprising:

a cathode electrode; and

a layer connected to the cathode electrode, wherein

a plurality of groups of particles, each group being constituted by at least two particles adjacent to each other, are arranged in the layer,

each of the particles comprises as a main component a material which has resistivity lower than resistivity of a material of the layer,

the adjacent two particles are arranged in a range of 5 nm or less,

one of the adjacent two particles is arranged to be nearer to the cathode electrode than the other particle, and

the plurality of groups of particles are arranged apart from each other by a distance equal to an average film thickness of the layer or more.

6. (previously presented): An electron-emitting device comprising:

a cathode electrode; and

a layer connected to the cathode electrode, wherein

a plurality of groups of particles, each group being constituted by at least two particles which comprise metal as a main component and are adjacent to each other, are arranged in the layer,

the layer comprises as a main component a material which has resistivity higher than resistivity of the particles,

the adjacent two particles are arranged in a range of 5 nm or less, and

one of the adjacent two particles is arranged to be nearer to the cathode electrode than the other particle.

7. (previously presented): An electron-emitting device comprising:

a cathode electrode; and

a layer which is connected to the cathode electrode and comprises carbon as a main component, wherein

a plurality of groups of particles, each group being constituted by at least two particles which comprise metal as a main component and are adjacent to each other, are arranged in the layer,

the plurality of groups of particles are arranged apart from each other by a distance equal to an average film thickness of the layer or more, and

a concentration of the metal in the carbon layer is lower on a surface side of the carbon layer than on the cathode electrode side.

8. (previously presented): An electron-emitting device comprising:

a cathode electrode; and

a layer which is connected to the cathode electrode and comprises carbon as a main component, wherein

a plurality of groups of particles constituted by at least two particles, which comprise metal as a main component, being adjacent to each other are arranged in the layer,

one of the adjacent two particles is arranged on the cathode electrode than the other particle, and

graphene is included between adjacent particles among at least part of the plurality of particles.

9. (original): An electron-emitting device comprising:

a cathode electrode;

a layer which is electrically connected to the cathode electrode and comprises carbon as a main component; and

a plurality of conductive particles arranged in the layer, each particle comprising carbon as a main component, wherein

the layer comprising carbon as a main component contains a hydrogen element of 0.1 atm% or more with respect to a carbon element.

10. (original): An electron-emitting device according to claim 9, wherein the layer comprising carbon as a main component contains a hydrogen element of 1 atm% or more with respect to the carbon element.

11. (original): An electron-emitting device according to claim 10, wherein the layer comprising carbon as a main component contains a hydrogen element of 20 atm% or less with respect to the carbon element.

12. (previously presented): An electron-emitting device according to claim 1, wherein surface unevenness of the layer is smaller than 1/10 of its film thickness in rms.

13. (previously presented): An electron-emitting device according to claim 1, wherein the layer comprises carbon as a main component.

14. (previously presented): An electron-emitting device according to claim 4, wherein an average concentration of hydrogen with respect to carbon in the layer is 0.1 atm% or more.

15. (previously presented): An electron-emitting device according to claim 4, wherein the layer comprising carbon as a main component has an sp^3 bonding.

16. (previously presented): An electron-emitting device according to claim 1, wherein the particles comprise metal as a main component.

17. (previously presented): An electron-emitting device according to claim 6, wherein the metal is metal selected from Co, Ni, and Fe.

18. (previously presented): An electron-emitting device according to claim 1, wherein the particles comprise monocrystalline metal as a main component.

19. (previously presented): An electron-emitting device according to claim 1, wherein the particles have an average particle diameter of 1 nm or more to 10 nm or less.

20. (previously presented): An electron-emitting device according to claim 1, wherein the layer has a thickness of 100 nm or less.

21. (previously presented): An electron-emitting device according to claim 1, wherein at least two adjacent particles among the plurality of particles are arranged 5 nm or less apart from each other.

22. (previously presented): An electron-emitting device according to claim 4, wherein a density of the particles in the layer is $1 \times 10^{14}/\text{cm}^3$ or more and $5 \times 10^{18}/\text{cm}^3$ or less.

23. (previously presented): An electron-emitting device according to claim 1, wherein a density of the particles in the layer is $1 \times 10^{15}/\text{cm}^3$ or more and $5 \times 10^{17}/\text{cm}^3$ or less.

24. (previously presented): An electron-emitting device according to claim 4, wherein a concentration of a main element of the particles with respect to a main element of the layer is 0.001 atm% or more and 1.5 atm% or less.

25. (previously presented): An electron-emitting device according to claim 1, wherein a concentration of a main element of the particles with respect to a main element of the layer is 0.05 atm% or more and 1 atm% or less.

26. (previously presented): An electron-emitting device according to claim 1, wherein:

the plurality of particles are arranged dispersedly in the layer as a plurality of groups of particles, each group being constituted by at least two adjacent particles,

one of the two adjacent particles are placed to be nearer to the cathode electrode than the other particle, and

the plurality of groups of particles are arranged apart from each other by a distance equal to an average film thickness of the layer or more.

27. (previously presented): An electron-emitting device according to claim 1, wherein the surface of the layer is terminated with hydrogen.

28. (previously presented): An electron-emitting device according to claim 1, further comprising:

an insulating film which is arranged on the cathode electrode and has a first opening; and

a gate electrode which is arranged on the insulating film and has a second opening, wherein

the first opening and the second opening communicate with each other, and the layer is exposed in the first opening.

29. (previously presented): An electron source, wherein a plurality of the electron-emitting devices according to claim 1 are arranged.

30. (original): An image display apparatus, characterized by comprising the electron source according to claim 29 and a light-emitting member which emits light by being irradiated with electrons.

31. - 40. (canceled).

41. (previously presented): An electron-emitting device comprising:

a cathode electrode; and

a layer electrically disposed on the cathode electrode, wherein

a plurality of particle groups comprising at least two adjacent particles are discretely distributed in the layer,

the particle comprises as a main component a material which has resistivity lower than resistivity of a material of the layer,

one of the adjacent particles is closer to the cathode electrode rather than the other(s) of the adjacent particles, and

the adjacent particles are disposed within a distance of 5nm.

42. (previously presented): An electron-emitting device according to claim 41, wherein the layer comprises carbon as a main component.

43. (previously presented): An electron-emitting device according to claim 42, wherein the layer contains hydrogen.

44. (previously presented): An image display apparatus comprising a plurality of electron-emitting devices and a light emitting member emitting light by irradiation with an electron emitted from the electron-emitting device, wherein the each of the electron-emitting devices is the electron-emitting devices according to claim 41.

45. (previously presented): An electron-emitting device comprising:
a cathode electrode;

a layer electrically connected to the cathode electrode containing carbon as a main component; and

a plurality of particles arranged in the layer containing carbon as a main component, wherein

the layer containing carbon as a main component contains hydrogen of 0.1-20 atm% at a ratio to the carbon.

46. (previously presented): An image display apparatus comprising a plurality of electron-emitting devices and a light emitting member emitting light by irradiation with an electron emitted from the electron-emitting device, wherein each of the electron-emitting devices is an electron-emitting device according to claim 45.